

CLAIMS

1. A light beam scanning apparatus comprising:
light beam emitting means for outputting a light
beam;

5 a beam scanner for reflecting the light beam
output from said light beam emitting device towards a
to-be-scanned surface to scan the to-be-scanned surface
by use of the light beam in a main scanning direction;

10 a first beam position detector for detecting the
light beam scanned on the to-be-scanned surface by said
beam scanner and generating an analog signal which is
continuously changed with a variation in the passage
position in a sub-scanning direction perpendicular to
the main scanning direction of the light beam; and

15 a controller for controlling the position of the
light beam scanned by said beam scanner on the to-be-
scanned surface to a preset position based on the
result of detection of said first beam position
detector.

20 2. The light beam scanning apparatus according
to claim 1, in which said light beam emitting means
includes a plurality of light beam emitting devices and
said beam scanner scans the to-be-scanned surface by
use of a plurality of light beams emitted from said
25 plurality of light beam emitting devices and which
further comprises light beam passage position changing
means of a number smaller than the number of said

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plurality of light beam emitting devices by one, for changing the passage position of the light beam in the sub-scanning direction; said controller determining one of the plurality of light beams as a reference beam and
5 changing the relative passage position of the remaining light beams with respect to the passage position of the reference light beam by use of said light beam passage position changing means.

3. The apparatus according to claim 1, which
10 further comprises a second beam position detector arranged on the upstream side in the main scanning direction of the light beam with respect to said first beam position detector, for detecting the passage of the light beam scanned by said beam scanner and
15 generating a timing signal; and integrating means for integrating the output of said first beam position detector in response to the timing signal from said second beam position detector; and in which said controller controls the passage position of the light
20 beam to a preset position based on the result of integration of said integrating means.

4. The apparatus according to claim 1, which further comprises:

a second beam position detector arranged on the
25 upstream side in the main scanning direction of the light beam with respect to said first beam position detector, for detecting the passage of the light beam

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scanned by said beam scanner and generating a first timing signal;

5 a third beam position detector arranged on the downstream side in the main scanning direction of the light beam with respect to said first beam position detector, for detecting the passage of the light beam scanned by said beam scanner and generating a second timing signal;

10 integrating means for integrating the output of said first beam position detector in response to the first timing signal from said second beam position detector; and

15 converting means for converting the result of integration by said integrating means from an analog signal to a digital signal in response to the second timing signal from said third beam position detector; and in which

20 said controller controls the passage position of the light beam to a preset position based on the digital signal converted by said converting means.

5. The apparatus according to claim 1, wherein said first beam position detector includes second and third beam position detectors;

25 said second beam position detector generates an output which continuously decreases with a variation in the passage position of the light beam in the sub-scanning direction,

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said third beam position detector is disposed separately from said second beam position detector in the sub-scanning direction and generates an output which continuously increases with a variation in the passage position of the light beam, and

said controller controls the passage position of the light beam to a preset position based on the results of detection of said second and third beam position detectors.

6. The apparatus according to claim 5, in which said light beam emitting means includes a plurality of light beam emitting devices and said beam scanner scans the to-be-scanned surface by use of a plurality of light beams emitted from said plurality of light beam emitting devices, and which further comprises:

light beam passage position changing means for changing the passage position of at least one of the plurality of light beams;

a fourth beam position detector having a plurality of light detecting sections arranged in a row in the sub-scanning direction between said second and third beam position detector, for detecting a plurality of light beams scanned by said beam scanner, a target passage position being set in a mid portion between every adjacent two of said light detecting sections;

beam selecting means for selectively causing one of said plurality of light beam emitting devices to

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emit light;

a second controller for controlling the passage position of the light beam based on the result of detection of said second and third beam position detectors by use of said light beam passage position changing means to permit one of the light beams scanned by said beam scanner to scan said fourth beam position detector; and

a third controller for controlling the passage position of the light beam based on the result of detection of said fourth beam position detector by use of said light beam passage position changing means to permit the light beam whose passage position is changed by said second controller to pass through one of the target passage positions.

7. The apparatus according to claim 6, further comprising:

a fifth beam position detector disposed separately from said second and third beam position detectors in the main scanning direction, for detecting the light beam used for scanning the to-be-scanned surface by said beam scanner and generating an output which continuously decreases with a variation in the passage position of the light beam;

a sixth beam position detector disposed adjacent to said fifth beam position detector in the sub-scanning direction, for detecting the light beam used

for scanning the to-be-scanned surface by said beam scanner and generating an output which continuously increases with a variation in the passage position of the light beam; and

5 inclination detecting means for detecting whole inclinations of said second to sixth beam position detectors with respect to the scanning direction of the light beam based on the results of detection of said second, third, fifth and sixth beam position detectors.

10 8. A light beam scanning apparatus comprising:
 a plurality of light beam emitting devices for outputting light beams;

 a beam scanner for reflecting the light beams output from said light beam emitting devices towards a
15 to-be-scanned surface to scan the to-be-scanned surface by use of the light beams in a main scanning direction;

 a first beam position detector for detecting the light beam scanned on the to-be-scanned surface by said beam scanner and generating an analog signal which is
20 continuously changed with a variation in the passage position in a sub-scanning direction perpendicular to the main scanning direction of the light beam;

 a first target light detecting member having a first passage target and disposed separately from said
25 first beam position detector in the main scanning direction;

 a second target light detecting member having a

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second passage target separated from the first passage target in the sub-scanning direction by a distance corresponding to preset resolution;

light beam passage position changing means for
5 changing the passage position of at least one of the plurality of light beams; and

a controller for controlling the relation of the respective passage positions of the plurality of light beams to a preset relation by use of said light beam
10 passage position changing means based on the outputs of said first beam position detector respectively obtained when the light beam has passed through the first and second passage targets.

9. The apparatus according to claim 8, wherein
15 said controller includes:

calculating means for calculating a difference between the outputs of said first beam position detector respectively obtained when the light beam has passed through the first and second passage targets;
20 and

means for changing the passage position of one of first and second light beams among the plurality of light beams by use of said beam passage position changing means to set the difference calculated by
25 said calculating means equal to a difference between outputs of said first beam position detector respectively obtained at the time of scanning by the

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first and second light beams.

10. The apparatus according to claim 9, which further comprises:

5 a third target light detecting member having a third passage target and disposed separately from said first beam position detector in the main scanning direction; and

10 a fourth target light detecting member having a fourth passage target separated from the third passage target in the sub-scanning direction by a distance corresponding to second resolution; and in which

15 said calculating means calculates a difference between the outputs of said first beam position detector respectively obtained when the light beam has passed through the third and fourth passage targets and said changing means controls said beam passage position changing means to set the difference calculated by said calculating means equal to a difference between outputs of said beam position detector respectively obtained at
20 the time of scanning by the first and second light beams among the plurality of light beams.

11. The apparatus according to claim 8, wherein said controller includes means for calculating an output variation rate with respect to a variation
25 in the passage position of the light beam of said [first] beam position detector based on the outputs of said [first] beam position detector respectively obtained when

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the light beam has passed through the first and second light passage targets; and means for controlling the passage positions of the plurality of light beams based on the variation rate.

5 12. A light beam scanning apparatus comprising:

 a plurality of light beam emitting devices for outputting light beams;

 a beam scanner for reflecting a plurality of light beams output from said plurality of light beam emitting devices towards a to-be-scanned surface to scan the
10 to-be-scanned surface by use of the plurality of light beam;

 a first beam position detector for detecting the light beam scanned on the to-be-scanned surface by said
15 beam scanner and generating an output which is continuously changed with a variation in the passage position of the light beam in a sub-scanning direction perpendicular to a main scanning direction of the light beam;

20 a second beam position detector disposed separately from said first beam position detector in the main scanning direction and having a width in the main scanning direction which is equal to a traveling distance of the light beam on said first beam position
25 detector passed when the light beam scans the first passage position;

 a third beam position detector disposed separately

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from said first beam position detector in the main scanning direction and having a width in the main scanning direction which is equal to a traveling distance of the light beam on said first beam position detector passed when the light beam scans the second passage position, the second passage position being separated from the first passage position in the sub-scanning direction by a distance corresponding to preset resolution;

10 light beam passage position changing means for changing the passage position of at least one of the plurality of light beams; and

 a controller for controlling the passage positions of the plurality of light beams to a preset position by use of said light beam passage position changing means based on the outputs of said second and third beam position detector respectively obtained when the light beam has passed through said second and third beam position detector.

20 13. The apparatus according to claim 12, wherein said controller includes:

 calculating means for calculating a difference between the outputs of said second and third beam position detector respectively obtained when the light beam has passed through said second and third beam position detector; and

 means for changing the passage position of one

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of first and second light beams among the plurality
of light beams by use of said first beam passage
position changing means to set the difference
calculated by said calculating means equal to a
5 difference between outputs of said beam position
detector respectively obtained at the time of scanning
by the first and second light beams.

14. The apparatus according to claim 13, which
further comprises fourth beam position detector
10 disposed separately from said first beam position
detector in the main scanning direction and having
a width in the main scanning direction which is equal
to a traveling distance of the light beam on said first
beam position detector passed when the light beam scans
15 the third passage position, the third passage position
being separated from the first passage position in the
sub-scanning direction by a distance corresponding to
second resolution; and in which

said calculating means calculates a difference
20 between the outputs of said second and fourth beam
position detector respectively obtained when the light
beam has passed through said second and fourth beam
position detector, and

said changing means changes the passage position
25 of one of the first and second light beams by use of
said beam passage position changing means to set the
difference between the outputs of said second and

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fourth beam position detector equal to a difference
between outputs of said first beam position detector
respectively obtained at the time of scanning by the
first and second light beams among the plurality of
5 light beams.

15. The apparatus according to claim 12, wherein
said controller includes:

calculating means for calculating an output
variation rate with respect to a variation in the
10 passage position of the light beam of said first beam
position detector based on the outputs of said second
and third beam position detector respectively obtained
when the light beam has passed through the second and
third beam position detector; and

15 means for changing the passage positions of the
plurality of light beams based on the output variation
rate by use of said beam passage position changing
means.

16. An image forming apparatus comprising:

20 light beam emitting means for outputting a light
beam according to an image data;

a beam scanner for reflecting the light beam
output from said light beam emitting devices towards an
image forming medium to scan the image forming medium
25 by use of the light beam in a main scanning direction
for forming an image on the image forming medium
according to the image data;

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a beam position detector for detecting the light
beam scanned on the image forming medium by said beam
scanner and generating an analog signal which is
continuously changed with a variation in the passage
5 position in a sub-scanning direction perpendicular to
the main scanning direction of the light beam; and

a controller for controlling the scanning position
of the light beam scanned by said beam scanner on the
image forming medium to a preset position based on the
10 result of detection of said beam position detector.

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